

What is claimed is:

1. An optical waveguide probe comprising:
a optical waveguide having cantilever-like shape;
a probe provided at a tip of the optical waveguide and sharpened
in a substantially vertical direction with respect to the optical
waveguide, the probe having a minute aperture at a tip of the probe;
and
a bent portion where a vicinity of the tip of the optical waveguide
is bent toward a side of the probe,
wherein the bent portion has a deflecting function for deflecting
a propagated light in the optical waveguide.
2. An optical waveguide probe according to claim 1, wherein a
deflection angle of the propagated light at the bent portion is 90
degrees or less.
3. An optical waveguide probe according to claim 1, wherein the
bent portion deflects the propagated light by a single surface.
4. An optical waveguide probe according to claim 3, wherein the
single surface is a surface orthogonal to an optical axis plane including
an optical axis from the optical waveguide to the minute aperture.
5. An optical waveguide probe according to claim 3, wherein the
single surface is a surface which is not orthogonal to an optical axis
plane.
6. An optical waveguide probe according to claim 5, wherein an
angle of the single surface with respect to a plane orthogonal to the
optical axis plane and including an optical axis of the waveguide is

45 degrees or less.

7. An optical waveguide probe according to claim 1, wherein the bent portion is bent at a plurality of surfaces substantially symmetrical with respect to an optical axis plane including an optical axis from the optical waveguide to the minute aperture.

8. An optical waveguide probe according to claim 7, wherein the plurality of surfaces are a plurality of flat surfaces.

9. An optical waveguide probe according to claim 8, wherein the plurality of flat surfaces are respectively not vertical to the optical axis plane.

10. An optical waveguide probe according to claim 1, wherein the bent portion includes a reflecting film.

11. An optical waveguide probe according to claim 1, further comprising a guide provided at a support portion of the optical waveguide, for positioning an optical element.

12. An optical waveguide probe according to claim 11, wherein the guide is a V groove.

13. A scanning near-field optical microscope comprising an optical waveguide probe,

wherein the optical waveguide probe comprises:

a cantilever-like optical waveguide;

a probe provided at a tip of the optical waveguide and sharpened in a substantially vertical direction with respect to the optical waveguide, the probe having a minute aperture at a tip of the probe; and

a bent portion where a vicinity of the tip of the optical waveguide

is bent toward a side of the probe,

wherein the bent portion has a deflecting function for deflecting a propagated light in the optical waveguide.

14. A manufacturing method of an optical waveguide probe used for a scanning near-field optical microscope, comprising:

a substrate formation step of forming a substrate on which an optical waveguide is deposited;

a deposition step of depositing the optical waveguide on the substrate; and

a separation step of separating a part of the optical waveguide from the substrate,

wherein in the substrate formation step, the bent-shaped substrate for bending the part of the optical waveguide is formed.

15. A manufacturing method of an optical waveguide probe according to claim 14, wherein the substrate formation step is a step of forming the substrate including a lower surface parallel to an optical axis of the optical waveguide, and a plurality of surfaces which are not vertical to the lower surface and are substantially symmetrical with respect to a plane including the optical axis and a normal of the lower surface.

16. A manufacturing method of an optical waveguide probe according to claim 14, wherein the substrate formation step is a step of forming the substrate by using an anisotropic etching.

17. A manufacturing method of an optical waveguide probe used for a scanning near-field optical microscope, in which two substrates bonded to each other through a material having a different etching

characteristic is used, the method comprising:

a step of forming a step portion for bending a part of an optical waveguide on one of the substrates; and

a step of forming a guide for an optical element on the other of the substrates.

18. A manufacturing method of an optical waveguide probe according to claim 17, wherein the substrate is a single crystal silicon substrate.

19. A manufacturing method of an optical waveguide probe according to claim 17, wherein the two substrates are single crystal silicon substrates having identical plane orientations.

20. A manufacturing method of an optical waveguide probe according to claim 17, wherein the two substrates are single crystal silicon substrates having different plane orientations.

21. A manufacturing method of an optical waveguide probe according to claim 17, wherein the substrates are bonded so that an optical axis direction of the optical waveguide of the substrate forming a mold is coincident with an optical axis direction of the guide of the substrate forming the guide.

22. A manufacturing method of an optical waveguide probe according to claim 17, wherein a core of the optical waveguide and a pattern for defining the guide for the optical element are simultaneously formed.